

REMARKS/ARGUMENTS

Claims 33-35 and 44-56 are pending in the present application. Claims 33, 44 and 46 are independent. Applicant has amended claims 33, 44 and 46. Support for the amendments may be found, for example, in the specification of the application at least at Fig. 1, page 5, lines 24-27, and page 6, lines 7-35. No new matter is added.

Claim Rejections under 35 U.S.C. § 103

The Examiner has rejected claims 33-35 and 44-56 under 35 U.S.C. §103 as being obvious over U.S. Patent No. 6,073, 683 to Osakabe et al. (“Osakabe”).

Osakabe discloses a cooling apparatus comprising a refrigerant tank which is placed adjacent to a radiating plate of a heat generating object. (Osakabe, Abstract). The Examiner acknowledges that Osakabe does not teach a mold die. However, the Examiner argues that Osakabe teaches a heat generating unit to which a cooling apparatus is attached. The Examiner further argues that it would have been obvious for one of ordinary skill in the art to recognize the cooling apparatus of Osakabe could be utilized for cooling elements to other heat generating units such as a die mold. The Examiner argues that the cooling apparatus and method of Osakabe is the same as the claimed method of cooling for the molding die.

Applicant has amended independent claim 33 to recite “a method of *uniformly* cooling a *molding surface* of a mold for dies and molding of articles using dies wherein the mold comprises at least one completely closed chamber having air substantially removed therefrom and having a single quantity of liquid therein which *extends to cover at least one area adjacent to the molding surface of said mold*, each of said at least one completely closed chamber being *integrated within* the mold.” The amendment clarifies that the liquid is adjacent to the molding surface to be cooled, and is therefore in direct contact with the molding surface where heat is generated. The amendment also clarifies

that the completely closed chamber is *integrated within* the mold. The amendment further clarifies that the molding surface is cooled *uniformly*. Applicant respectfully submits that Osakabe does not disclose a method of uniformly cooling a molding surface of a mold for dies and molding of articles using dies wherein the mold comprises at least one completely closed chamber having air substantially removed therefrom and having a single quantity of liquid therein which extends to cover at least one area adjacent to the molding surface of said mold, each of said at least one completely closed chamber being integrated within the mold.

Applicant further submits that it would not have been obvious to one skilled in the art to adapt the cooling apparatus disclosed in Okasabe to perform the method recited in claim 33. Specifically, Applicant respectfully submits that the combination suggested by the Examiner would not result in the claimed invention. Even if it is considered obvious to adapt Okasabe to cool other heat generating units including molds, as the Examiner claims, the result would not be the same as the claimed invention for at least the three reasons enumerated below.

First, claim 33 recites at least one completely closed chamber being *integrated within the mold*. Thus, if the applying the cooling apparatus of Osakabe to molds renders the claimed invention obvious, Osakabe should at least disclose at least one completely closed chamber integrated *within* the heated object to be cooled. Instead, Okasabe's cooling apparatus is located completely *external* to the heat generating unit 2. The heat generating IGBT module 2 of Okasabe comprises an *external* radiating plate in contact with the cooling apparatus of Okasabe. Okasabe teaches that the heat generating module 2 is coupled with a radiating plate 2a made of a metal superior in heat conductivity (*i.e.* a heat sink), and that the radiating plate 2a is located adjacent to a refrigerant tank 3 of the cooling apparatus, optionally coupled with a conductive grease. (Osakabe, col. 7, lines 1-10).

Second, claim 33 recites a method for uniformly cooling a molding surface of a mold wherein the mold comprises at least one completely closed chamber with liquid which extends to cover at least one area adjacent to the molding surface. Thus, if the applying the cooling apparatus of Osakabe to molds renders the claimed invention obvious, Osakabe should at least disclose at least one completely closed chamber which extends to cover at least one area adjacent to the heated object. Although Osakabe teaches that the refrigerant tank 3 is adjacent to radiating plate 2a, radiating plate 2a merely acts as the heat sink of the actual heated object to be cooled, IGBT module 2. Thus, Osakabe does not teach that the refrigerant tank 3 is adjacent to the heated object to be cooled.

Third, claim 33 recites a method for uniformly cooling a molding surface. Osakabe's cooling apparatus is not directed to uniformly cooling a surface and does not contemplate heat transfer beyond transfer from a heat sink connected to an object generating heat. The uniform cooling is a result of the recited claim limitations, which Osakabe lacks. For example, claim 33 recites that the completely closed chamber comprises a single quantity of liquid therein which extends to cover at least one area adjacent to the molding surface. One exemplary effect of the specifically claimed structure is that "the temperature of the die is automatically evened out because boiling will occur preferentially at the higher temperature locations thereby reducing its temperature to that of its surrounding areas." (Specification, page 9, lines 32-35). Another example of an effect of the specifically claimed structure is that "water adjacent to the hotter parts of the die will be caused to boil ... result[ing] in very efficient extraction of heat from the hotter parts of the die." (Specification, page 8, lines 12-16). **The recited configuration in claim 33 enables the cooling effect to be more applicable to the hotter parts of the molding surface.** Uniformly cooling the molding surface is a very significant factor in the repetition rate of use for a die and for proper molding without distortion of the molded parts. (Specification, page 1, lines 31-35).

In summary, Osakabe discloses a cooling apparatus comprising a refrigerant tank which is placed adjacent to a radiating plate of a heat generating object, wherein the refrigerant tank is completely external to the heat generating object. Applicant respectfully submits that it would not have been obvious to a person of skill in the ordinary art to modify the cooling apparatus of Osakabe such that the refrigerant tank is provided *within* the mold, *i.e.* the object to be cooled, wherein the refrigerant liquid extends to cover at least one area adjacent to the molding surface. Thus, Osakabe does not render obvious a method of uniformly cooling a molding surface of a mold for dies and molding of articles using dies wherein the mold comprises at least one completely closed chamber having air substantially removed therefrom and having a single quantity of liquid therein which extends to cover at least one area adjacent to the molding surface of said mold, each of said at least one completely closed chamber being integrated within the mold as recited in claim 33.

For at least the reasons above, Applicant submits that independent claim 33 is patentable over Osakabe.

Claims 34-35 depend from claim 33. Applicant respectfully submits that, for at least the reasons discussed above with respect to claim 1, claims 34-35 are patentable over Osakabe by virtue of their dependency.

Regarding independent claim 46, Applicant respectfully submits that Osakabe does not disclose “a method of effecting heat transfer within a mold to assist in effecting *substantial uniformity of temperature* of molding surfaces of a molding cavity” as recited.

Applicant has amended independent claims 44 and 46 in accordance with the amendments to claim 33. Applicant respectfully submits that, for at least the reasons discussed above, claims 44 and 46 are patentable over Osakabe.

Claims 45 and 47-56 depend from claims 44 and 46. Applicant respectfully submits that, for at least the reasons discussed above with respect to claims 33, 44 and 46, claims 45 and 47-56 are patentable over Osakabe by virtue of their dependency.

CONCLUSION

Applicant asserts that the claims as presented herein are patentable over the cited prior art for at least the reasons stated herein and are therefore in condition for allowance. Applicant respectfully requests a timely Notice of Allowance for the claims in this case.

Respectfully Submitted,

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